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The June 5, 2010 Tornado Outbreak

by Jeff Kilburg, Student Volunteer

June 5, 2010 began similarly to many other severe weather days: conditions marked by extensive cloud cover and relatively cool temperatures. However, there was anticipation that breaks in the cloud cover would allow for enough destabilization; a condition supportive of thunderstorm initiation. With a weak center of low pressure in western Iowa and a somewhat diffuse warm front draped across southern Wisconsin, the general thought was that storms would initiate where the center of low pressure and warm front intersected (known as a triple point).

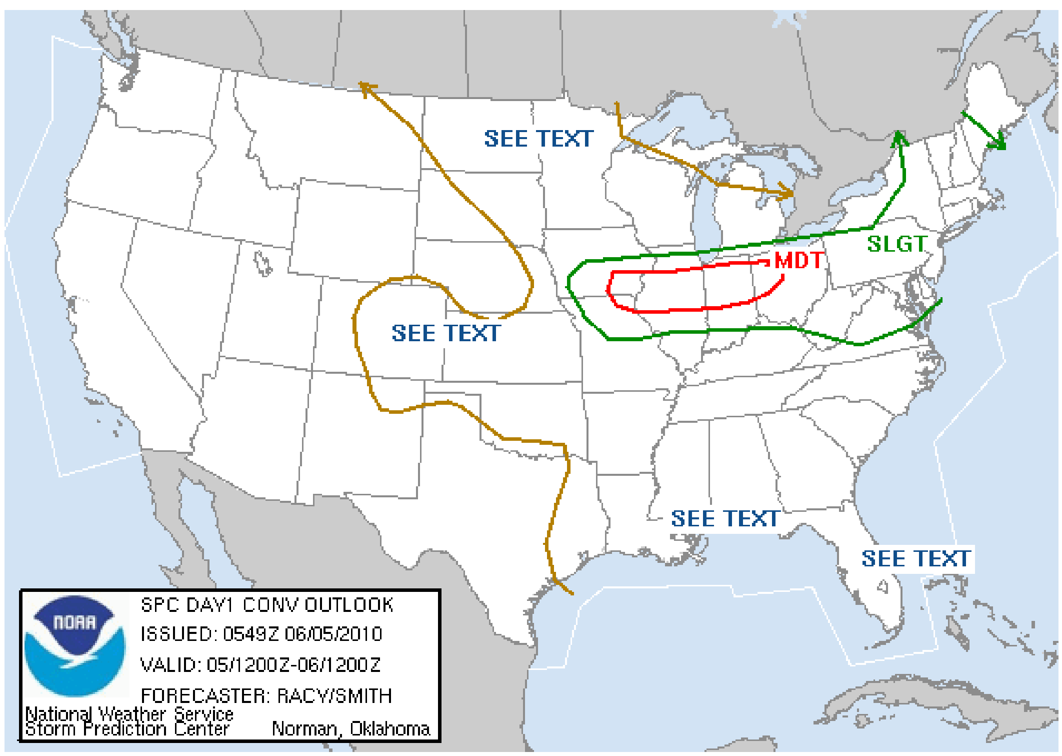

Figure 1- Updated (06z, 5 June 2010) Storm Prediction Center (SPC) Convective Outlook for 5 June 2010 (local time)

At 4:30 pm, visible satellite showed clearing skies in southeast Iowa and central Illinois, and surface observations confirmed the clearing. Temperatures topped the 80-degree mark, and dewpoints in the lower 70's indicated considerable atmospheric moisture. During the late afternoon, some showers began to develop in southeastern Iowa, well in advance of the cold front. These showers were slow to strengthen but were heading into a moderately unstable environment attended by ample wind shear (15 or more knots at 0-1 km above ground level).

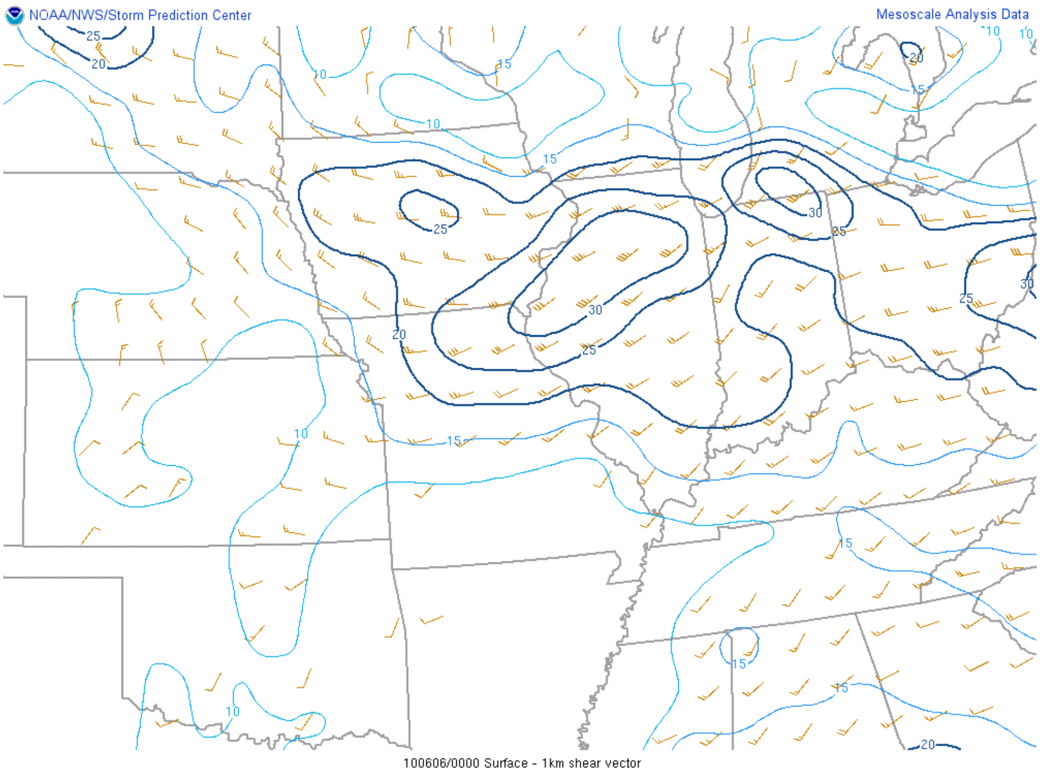

Figure 2- SPC mesoanalysis as of 0z, 6 June 2010, showing 0-1km bulk shear values.

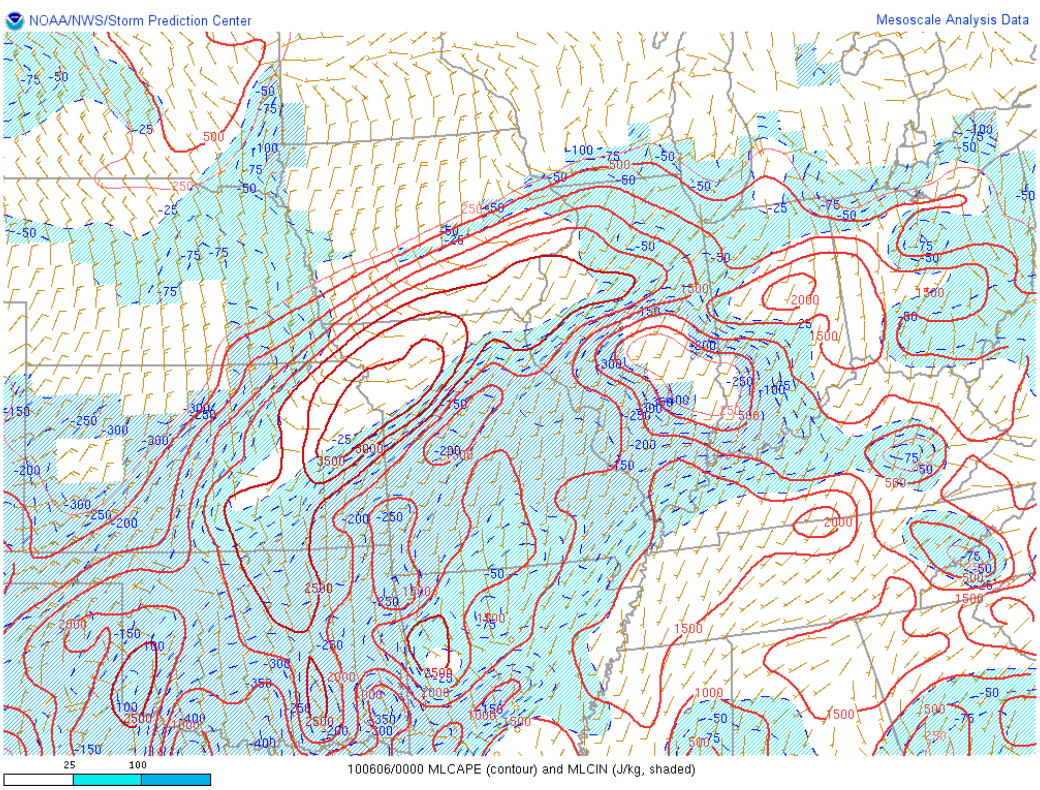

Figure 3- SPC mesoanalysis as of 0z , 6 June 2010, showing mixed layer convective available potential energy (MLCAPE) values.

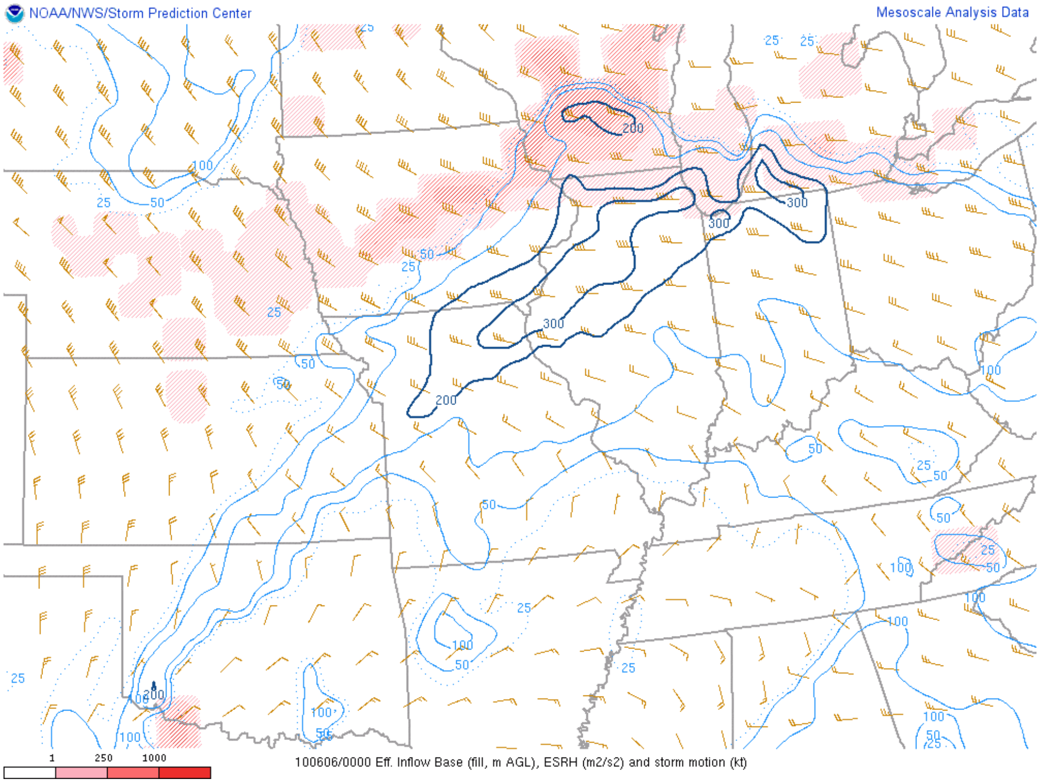

Figure 4- SPC mesoanalysis showing more-than-adequate effective SRH values, which quantify the potential for rotating updrafts and suggest tornado development when sufficiently high.

These showers had an elevated appearance, mainly due to their forcing mechanism (i.e., probable frontogenesis). Upon looking at the 0z soundings from KVDN and KILX, a slight capping inversion was evident. This was helping keep a "hold" on the convection. However, with the approach of the mid-level shortwave; synoptically induced lift coupled with a 70-knot jet streak quickly eroded the cap.

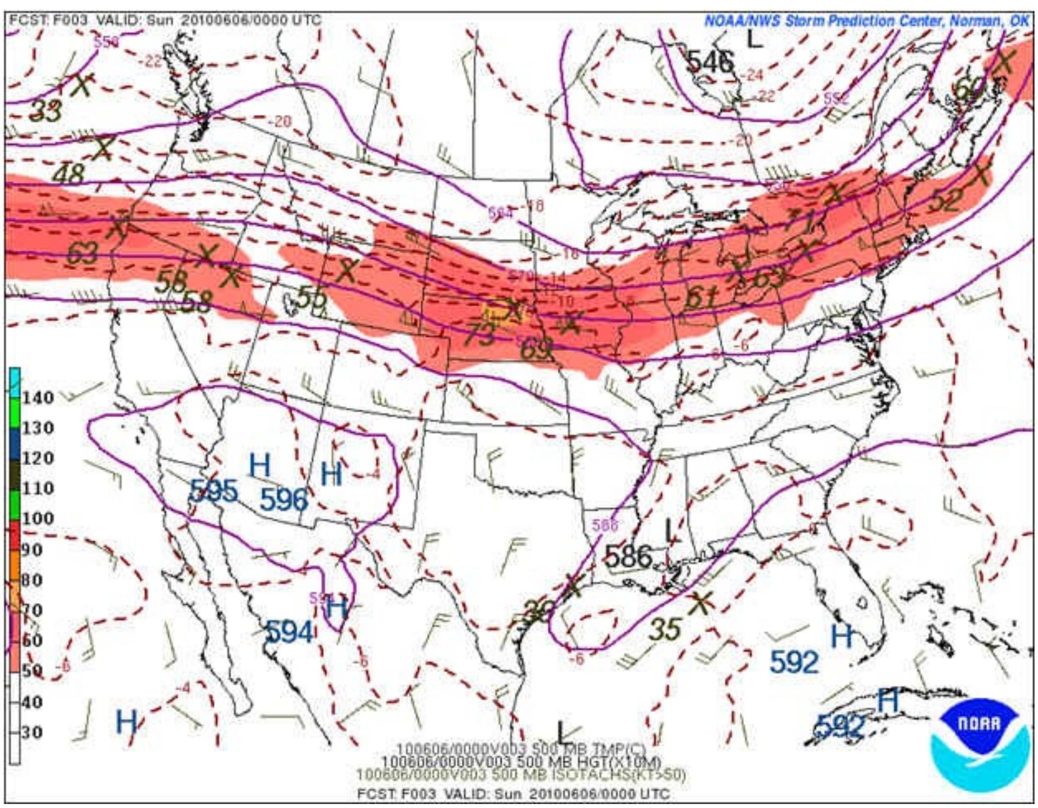

Figure 5- SPC 500-mb analysis showing mid-level jet streak associated with shortwave trough.

With the cap finally eroded, the showers in southeast Iowa and western Illinois underwent a rapid intensification. Several of these thunderstorms developed into classic supercells. One of the supercells in northwestern Marshall County was exhibiting significant rotation as it neared Putnam County. The first tornado to be reported in association with this cell developed on the east side of Sawmill Lake. The tornado continued to Magnolia, where significant damage was reported on the north side. This tornado continued 1.25 miles into LaSalle County, where it finally dissipated. This supercell continued its eastward track and was responsible for several more tornadoes, which included the Streator and Dwight tornadoes.

The Streator tornado was assigned a maximum rating of an EF-2 after causing significant structural damage on the southern side of the city, where it had a maximum width of 0.25-0.5 mile. That tornado lifted quickly upon exiting Streator, but the supercell quickly dropped another another tornado just north of Illinois 17 between Streator and Dwight. This tornado was assigned maximum rating of EF-3, and, although it touched down in a rural area, it caused significant damage to several buildings, including a barn. Along with causing structural damage to buildings, the tornado collapsed a metal-truss high-tension electrical tower and bent several other towers in its path. This tornado continued for 8.8 miles before lifting.

(above) Figure 6-Tornado damage east of Streator, IL. (below) Figure 7-Tornado damage on high tension towers in between Streator and Dwight, IL (EF-3 Rating).

This supercell continued east toward Dwight, where it produced two more tornadoes. The southern tornado was more significant, as it produced high-end EF-2 damage at its maximum strength. It started just to the west of the Dwight Country Club Golf Course, where it proceeded to carve a 300-yd. wide path. The tornado displaced golf carts, uprooted and snapped off several large trees, and partially tore off several roofs at the golf course. The tornado continued due east, where it passed through the southern end of Dwight, where its strength was consistent with high-end EF-2 damage. The second, less signifcant tornado associated with this supercell was a few miles north of Dwight. It was rated as an EF-0.

Figure 8- Tornado damage to Dwight Country Club.

Figure 9- Tornado damage to Dwight Country Club.

Figure 10- Tornado damage to south side of Dwight, IL on Route 66, just east of I-55 (EF-2 Rating).

Overall, there were 12 confirmed tornadoes in the Chicago-Romeoville County Warning Area, which encompasses portions of northern and central Illinois and northwest Indiana.

Sources:

"Summary of June 5, 2010 Tornado Outbreak." *National Weather Service - Central Region Headquarters Home Page*. 10 June 2010. Web. 09 June 2011. http://www.crh.noaa.gov/lot/?n=05june2010summary.

"June 5, 2010 Tornadoes." *National Weather Service - Central Region Headquarters Home Page*. Web. 09 June 2011. http://www.crh.noaa.gov/dvn/?n=magnoliatornado.

Beat the Heat, Check the Backseat!

By Jim Allsopp, Warning Coordination Meteorologist

Each year children die from hyperthermia as a result of being left enclosed in parked vehicles. Hyperthermia is an acute condition that occurs when the body absorbs more heat than it can dissipate. This can occur even on a mild day. Studies have shown that the temperature inside a parked vehicle can rise rapidly to a dangerous level for children, adults, and pets. Leaving the windows slightly open does not significantly decrease the heating rate. The effects can be more severe on children because their bodies warm at a faster rate than adults.

In 2010, there were nearly 50 children who died in vehicle hyperthermia related incidents. Tragically, in the past week alone there have been 5 juvenile vehicular hyperthermia deaths across the nation, bringing the year's total to 15. An examination of media reports about the 494 child vehicular hyperthermia deaths for a 13 year period (1998 through 2010) shows the following circumstances:

51% - child "forgotten" by caregiver (253 Children)
30% - child playing in unattended vehicle (150)
17% - child intentionally left in vehicle by adult (86)
1% - circumstances unknown (5)

For more information about heat visit http://www.crh.noaa.gov/lmk/?n=noaaexcessiveheat

For more information about hyperthermia deaths of children in vehicles, visit: http://ggweather.com/heat/

Lake Michigan Seiches

By Jim Allsopp, Warning Coordination Meteorologist and Tim Seeley, Marine Program Leader

A seiche (pronounced “saysh”) is a standing wave in an enclosed body of water. Seiches occasionally occur on Lake Michigan, causing sudden fluctuations of water levels along the shore of the lake. The vast majority of seiches go unnoticed due to their small magnitude. Occasionally, when certain conditions occur, a significant seiche will be generated, causing rapid rises and falls of several feet in lake levels.

A seiche occurs when water that has “piled up” on one part of the lake returns to the opposite side of the lake, as the force of gravity returns this imbalance in water levels to equilibrium. The oscillating motion is usually produced by wind and pressure changes. For a significant seiche along the Illinois shore of Lake Michigan, strong downdraft winds spreading out with, or just ahead of, a rapidly moving line of thunderstorms moves across the southern end of the lake. The cold, dense outflow from the line of thunderstorms, or squall line, also produces a jump in barometric pressure. The combined forces of the strong winds and the pressure rise cause a surge of water, a foot or two in height, to impact the southeast shores of the lake. There typically is a corresponding drop in water levels on the upwind side of the lake as water is piled up down wind.

As the thunderstorms move ashore, the strong winds and the pressure rise quickly subside. The surge of water reflects off the southwest Lower Michigan and northwest Indiana shores, moving back across the south basin of Lake Michigan. It usually takes around an hour and a half for the reflected surge, or seiche, to travel back across the south end of the lake to the Illinois shore.

This oscillating back and forth between the east and west shores typically continues for a few hours, with each rise and fall decreasing in amplitude as the energy imparted to the water by the strong winds and pressure rise is gradually dissipated

The most favorable conditions for a significant seiche along the Illinois shore is for a solid squall line, with strong outflow winds, to move from northwest to southeast at around 60 mph across the south end of Lake Michigan.

The largest seiche reported along the Chicago shore occurred on June 26, 1954, when Lake Michigan rapidly rose 10 feet, sweeping seven fishermen to their deaths from a breakwall at Montrose Harbor, and an eight from North Avenue Bridge.

Here is the danger of significant seiches: they usually occur on the west shore of Lake Michigan a couple hours after the thunderstorms that generated them have moved out of the area. People return to the water’s edge as the weather has cleared, only to be caught off guard by the rapidly rising water that seems to come from nowhere.

Seiches can generate strong rip currents as well. As the water level at the shore quickly falls, much of this massive amount of water flows through breaks, or rips, in offshore sandbars.

Break the Grip of the Rip – Talk About Rip Currents with Your Kids Before You Go to the Beach!

By Ed Fenelon, Meteorologist in Charge

The summer beach season is upon us! Being smart in the water may save your life or the life of a loved one. Teach yourself and your loved ones about rip currents. Rip currents are the most dangerous hazard for beach swimmers. Rip currents are powerful, channeled currents of water flowing away from the beach and out to sea. Rip currents can form whenever there are breaking waves and can be difficult to see from the beach.

The United States Lifesaving Association (USLA) estimates that the annual number of deaths due to rip currents on our nation's beaches exceeds 100. Lifeguards protecting the beaches of the U.S. rescue 60,000 swimmers annually, and rip currents account for over 80% of these rescues. Last year alone there were 30 drowning due to rip currents on the Great Lakes.

The National Weather Service issues a Surf Zone Forecast that includes the rip current risk for area beaches. Surf Zone Forecast (SRF) provides information on the hazards of the surf zone to beach goers and typically describes the following: Sky condition, precipitation, air temperature, wind speed and direction, wave height, surf temperature, and rip currents. The Surf Zone forecast can be found at http://www.crh.noaa.gov/product.php?site=LOT&product=SRF&issuedby=LOT

Persistent onshore wind, breaking onshore wave conditions, and reports from lifeguards are three of the main "signals" that NWS meteorologists seek to identify when preparing a Rip Current Outlook. Collaborative efforts between NWS offices and the local lifeguards complete the forecast process. Lifeguards and other beach partners play a critical role in the success of the program by providing real time feedback for inclusion in the rip current outlook. The reports from trained observers provide forecast verification, which will lead to improved forecasts in the future.

Low, Moderate, and High Risks of Rip Currents are predicted in NWS forecasts:

- "Low Risk" means wind and/or wave conditions are not expected to support the development of rip currents. However, rip currents can sometimes occur, especially in the vicinity of groins, jetties, and piers. Know how to swim and heed the advice of the beach patrol/lifeguards.
- "Moderate Risk" means wind and/or wave conditions support stronger or more frequent rip currents. Only experienced surf swimmers should enter the water.
- “High Risk" means wind and/or wave conditions support dangerous rip currents. Rip Currents are life-threatening to anyone entering the surf.

Whenever a moderate or high risk exists, the NWS will issue a Rip Current Statement which can be found at http://www.crh.noaa.gov/product.php?site=LOT&product=CFW&issuedby=LOT

Tips to avoid rip current hazards:

- Before you leave for the beach, check the latest National Weather Service Surf Zone Forecast for local beach conditions.
- If you'll be in surf, learn to swim in surf. It's not the same as a pool or lake.
- Never swim alone.
- Swim near a lifeguard.
- Look for posted signs and warning flags, which may indicate higher than usual hazards, or check with lifeguards before swimming.
- Obey all instructions provided by lifeguards.

If caught in a rip current:

- Don't fight the current.
- Think of it like a treadmill you can't turn off. You want to step to the side of it.
- Swim across the current in a direction following the shoreline.
- When out of the current, swim and angle away from the current and towards shore.
- If you can't escape this way, try to float or calmly tread water. Rip current strength eventually subsides offshore. When it does, swim towards shore.
- If at any time you feel you will be unable to reach shore, draw attention to yourself: face the shore, wave your arms, and yell for help.